

**THIRD FIVE-YEAR REVIEW REPORT FOR
JIS LANDFILL SUPERFUND SITE
MIDDLESEX COUNTY, NEW JERSEY**



Prepared by

**U.S. Environmental Protection Agency
Region 2
New York, New York**

January 2015

A handwritten signature in dark ink, appearing to read "Walter E. Mugdan", is written over a horizontal dashed line.

**Walter E. Mugdan, Division Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency**

A handwritten date "JAN. 12, 2015" is written in dark ink over a horizontal dashed line.

Date

308364

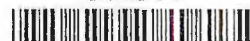


TABLE OF CONTENTS

Executive Summary	i
Five-Year Review Summary Form.....	ii
Introduction.....	1
Site Chronology	1
Background	1
<i>Site Location and Description</i>	<i>1</i>
<i>Geology/Hydrogeology</i>	<i>2</i>
<i>Land and Resource Use</i>	<i>2</i>
<i>History of Contamination</i>	<i>2</i>
<i>Initial Response.....</i>	<i>3</i>
<i>Basis for Taking Action.....</i>	<i>3</i>
Remedial Actions	4
<i>Remedy Selection</i>	<i>4</i>
<i>Remedy Implementation.....</i>	<i>6</i>
<i>System Operations/Operation and Maintenance/Monitoring.....</i>	<i>8</i>
Progress Since the Last Five-Year Review	9
Five-Year Review Process	10
<i>Administrative Components</i>	<i>10</i>
<i>Community Involvement.....</i>	<i>10</i>
<i>Document Review.....</i>	<i>11</i>
<i>Data Review</i>	<i>11</i>
<i>Site Inspection.....</i>	<i>13</i>
<i>Interviews.....</i>	<i>13</i>
<i>Institutional Controls Verification.....</i>	<i>13</i>
Remedy Assessment.....	13
<i>Question A: Is the remedy functioning as intended by the decision documents?</i>	<i>13</i>
<i>Question B: Are the exposure assumptions, toxicity data, cleanup levels, and.....</i>	<i>14</i>
<i>remedial action objectives (RAOs) used at the time of the remedy still valid?</i>	
<i>Question C: Has any other information come to light that could call into question... </i>	<i>16</i>
<i>the protectiveness of the remedy?</i>	
<i>Technical Assessment Summary</i>	<i>16</i>
Recommendations and Follow-up Actions	16
Protectiveness Statement(s).....	16
Next Review	17
Tables	18
<i>Table 1 – Chronology of site events.....</i>	<i>18</i>
<i>Table 2 – Remediation goals.....</i>	<i>19</i>
<i>Table 3 – Documents reviewed.....</i>	<i>21</i>
Figures.....	22
<i>Figure 1 – Site plan.....</i>	<i>22</i>
<i>Figure 2 – MW53 and MP-6 benzene concentrations</i>	<i>23</i>
<i>Figure 3 – Areal extent of plume</i>	<i>24</i>

EXECUTIVE SUMMARY

This is the third five-year review for the JIS Landfill Superfund Site, located in South Brunswick, Middlesex County, New Jersey. The purpose of this five-year review is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory five-year review is the completion date of the previous five-year review, signed April 6, 2010.

The remedy is protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: JIS Landfill Site		
EPA ID: NJD97400998		
Region: 2	State: NJ	City/County: South Brunswick/Middlesex County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA If “Other Federal Agency” was selected above, enter Agency name: Click here to enter text.		
Author name (Federal or State Project Manager): Ashley Similo		
Author affiliation: EPA		
Review period: 04/06/2010 – 01/05/2015		
Date of site inspection: 08/28/2014		
Type of review: Statutory		
Review number: 3		
Triggering action date: 04/06/2010		
Due date (<i>five years after triggering action date</i>): 04/06/2015		

Five-Year Review Summary Form (continued)

The table below is for the purpose of the summary form and associated data entry and does not replace the two tables required in Section VIII and IX by the FYR guidance. Instead, data entry in this section should match information in Section VII and IX of the FYR report.

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:

OU1

To add additional issues/recommendations here, copy and paste the above table as many times as necessary to document all issues/recommendations identified in the FYR report.

Protectiveness Statement(s)

Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>	<i>Addendum Due Date (if applicable):</i>
1	Protective	N/A

Protectiveness Statement:

The remedy at OU1 is protective of human health and the environment.

Sitewide Protectiveness Statement (if applicable)

For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.

<i>Protectiveness Determination:</i>	<i>Addendum Due Date (if applicable):</i>
Protective	N/A

Protectiveness Statement:

The remedy is protective of human health and the environment.

Five-Year Review Report

I. Introduction

The purpose of a five-year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment and is functioning as intended by the decision documents. The methods, funding, and conclusions of reviews are documented in the five-year review. In addition, five-year review reports identify issues found during the review, if any, and document recommendations to address them.

This is the third five-year review for the JIS Landfill Superfund Site (Site), located in South Brunswick, Middlesex County, New Jersey. This five-year review was conducted by United States Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Ashley Similo. The review was conducted pursuant to Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii), and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the Site file.

The triggering action for this statutory review is the completion date of the previous five-year review. A five year review is required at this Site due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one operable unit, which is addressed in this five-year review.

II. Site Chronology

See Table 1 for the Site chronology.

III. Background

Site Location and Description:

The JIS Landfill Site covers approximately 24 acres, which includes a 7.8 acre landfill and a waste transfer operation and a downgradient plume located on Cranbury South River Road (Route 535) in South Brunswick Township, Middlesex County, New Jersey (Figure 1). The Site includes a landfill immediately east of the New Jersey Turnpike, an inactive borrow pit and a solid waste recycling facility. The north side and south side of the Site adjoin newly constructed commercial warehouses. Additional agricultural fields, as well as residential as of Monroe Township and the Borough of Jamesburg, are located east of the Site.

Geology/Hydrogeology:

The Site is situated in the northeastern part of the New Jersey Coastal Plain. Two major aquifers underlie the Site: the Old Bridge Sand Aquifer and the underlying Farrington Sand Aquifer. Both aquifers are major sources of potable water in Middlesex County. In the area of the Site, they are separated by the Woodbridge Clay formation, which serves to limit contamination to the Old Bridge Sand Aquifer. Groundwater flows in an east-southeasterly direction. Manalapan Brook is a discharge point for shallow groundwater, while the majority of the groundwater continues to flow to the east beneath the Brook.

Land and Resource Use:

The JIS property is currently used for commercial purposes as well as for operation of a biosparge treatment system that is part of the selected remedy, discussed below. The most reasonably anticipated future use of the JIS property is not expected to change from the current usage, although the commercial activity may vary.

The Site (including the JIS property and those properties above the primary and secondary plumes) is mostly commercial and agricultural in nature, with some sparse residential population associated mostly with the secondary plume. The underlying Old Bridge Aquifer is a Class II, or potable water, aquifer. Groundwater is currently not a source of potable water in the area of the Site, as a municipal water supply is available.

There is the potential for residential development of some of the agricultural land over the groundwater contamination. Water usage for any new construction within the area above the primary and secondary plumes will be controlled through the NJDEP's CEA, which is part of the selected remedy of the 2009 ROD Amendment and was approved in May 2013.

History of Contamination:

Landfilling at the Site began in 1955. The JIS facility accepted a wide variety of chemical, municipal and industrial wastes which allegedly contained hazardous substances. According to the NJDEP, these wastes included broken battery casings, paint sludges, solvents, pesticide impregnated plastics, oil sludges, and 55-gallon drums. This activity continued until 1976, at which point the disposal of additional chemical or hazardous wastes was prohibited. Disposal of other materials continued until 1985, when the landfill was closed.

Groundwater contamination related to the Site was first detected in 1975. Contaminants of Concern (COCs) are migrating away from the JIS Landfill in a "primary" plume and a "secondary" plume. COC concentrations have historically been much higher in the primary plume. The primary plume includes contaminated groundwater which originates beneath the landfill and extends in an easterly direction approximately 5,000 feet to monitoring well MW-20. The secondary plume extends beyond MW-20. As the COCs in the primary plume move in an easterly direction with the natural groundwater flow, they also migrate toward the bottom of the

Old Bridge Formation, which ranges in depth from 75 to 120 feet below grade in the vicinity of the groundwater contamination. This formation is underlain by the low-permeability Woodbridge Clay that defines the base of the aquifer. The COCs exist in a relatively narrow band of contaminated groundwater no wider than 1,000 feet in both plumes.

The Site was placed on the NPL in September 1983.

Initial Responses:

From 1980 to 1985, JIS installed a solid waste cap over portions of the landfill. Installation of this cap did not satisfy NJDEP's requirements for Site closure, as the cap did not comply with the conditions specified in a State court order.

EPA used its removal action authority to provide bottled water to homes with impacted groundwater wells from June 1989 until February 1992, when connections to a municipal water system were completed. Since that time, a group of potentially responsible parties (PRPs), i.e., the JIS Performing Parties Group (the Group), has connected additional homes to the municipal water supply system to prevent ingestion of contaminated groundwater from private wells.

Basis for Taking Action:

The landfill and surrounding Site property is owned and maintained by JIS, Inc., a PRP for the Site. The Group is subject to three active Administrative Orders (AOs) with NJDEP. The 1997 Order directs 37 JIS PRPs to cooperate in performing the remedial design and remedial action activities called for in the 1995 ROD, including the maintenance of appropriate access controls on the Site. The second Order was issued in August of 2004 and directed the Group to perform a biosparge pilot study as well as to further investigate the secondary plume. A Unilateral Administrative Order was issued in September 2010 with EPA, where Site remediation formally changed from state-lead to EPA-lead, and directed the Group to perform operation and maintenance of the biosparge treatment plant and groundwater monitoring.

The 1995 ROD identified the following hazardous substances as COCs in groundwater and soil:

Groundwater

Antimony
Benzene
Chromium
1,2-dichloroethylene
Ethylbenzene
Lead
Methylene chloride
Toluene
Trichloroethylene (TCE)

Soil

Arsenic
Chromium
Lead
1,1,1-trichloroethane
Di-n-butylphthalate
Phenanthrene
Pyrene
Bis-2-ethylhexylphthalate
Aroclor-1260

Vinyl chloride
Xylenes

4,4-DDE
4,4-DDT

The RI/FS evaluated human health and ecological risks. A human health risk assessment was conducted and evaluated the following groundwater exposure pathway: ingestion of groundwater by residents and inhalation of volatiles in the groundwater by residents using tapwater. The risk analysis indicated that the combined cancer risk for adults and children is 6.9×10^{-3} , which is above the EPA acceptable risk range. The risk was primarily driven by exposure to benzene.

A Baseline Ecological Evaluation (BEE) and a Screening Level Ecological Risk Assessment (SLERA) were performed at the Site. Both evaluations focused on the downgradient surface water discharge areas associated with the secondary plume. These evaluations concluded that there were no significant ecological effects caused by the plume's discharge to the surface water or wetland areas.

As a result of monitoring performed since the ROD, several of the contaminants identified as COCs in groundwater during the RI/FS were determined to no longer pose a concern, while additional COCs were identified and added to the list. The present accounting of COCs for groundwater for the JIS Site is included in Table 5 of the ROD Amendment.

IV. Remedial Actions

Remedy Selection:

The ROD for the JIS Landfill was signed by EPA on August 15, 1995. The ROD listed Remedial Action Objectives (RAOs) which are specific objectives to protect human health and the environment. These objectives are based on available information and standards, such as Applicable or Relevant and Appropriate Requirements (ARARs), and risk-based contaminant levels established in the Baseline Risk Assessment. Because the Baseline Risk Assessment established that the groundwater at the Site poses an unacceptable risk to human health, the following RAOs were established:

Source Control

- o Prevent or reduce further migration of contaminants from the landfill into the groundwater.

Groundwater

- o Prevent human exposure to contaminated groundwater.
- o Prevent further migration of contaminated groundwater off-Site.

- o Prevent the migration of contaminated groundwater into the underlying aquifers.
- o Reduce contaminant concentrations in the Old Bridge Aquifer to levels which do not exceed applicable Federal and State water quality standards.

To address these RAOs, the ROD called for a number of remedial actions to mitigate exposures and restore the environment. The major elements of the 1995 remedy are presented below.

- o An alternative water supply was to be provided for residents with contaminated drinking water wells by connecting the homes to the municipal water supply.
- o The existing landfill cap was to be upgraded to include the following elements: a) 24 inches of vegetated topsoil; b) a 12-inch soil drainage layer, c) a textured synthetic material layer; and d) a 12-inch clay layer with a maximum permeability of 1×10^{-7} cm/sec.
- o An extraction and treatment system was to be constructed to remediate contaminated groundwater from the primary plume of the Site. The primary plume refers to that portion of the plume closer to the landfill. The treatment facility was to be constructed downgradient of the JIS property, with discharge of the treated water to a recharge trench.
- o The secondary plume, i.e., that portion of the plume east of MW-20 and further from the Site, was to be monitored to determine if the downgradient contamination would attenuate via natural processes.
- o A groundwater monitoring program was to be designed to monitor concentrations in the primary and secondary plumes, as well as to measure the effectiveness of the groundwater extraction system.
- o Well-use restrictions were to be put into place to prevent the installation of new wells in the contaminated portion of the aquifer.
- o Appropriate deed restrictions were to be put in place for the landfill.

Several of the components of the 1995-selected remedy were implemented, such as the installation of the upgraded cap in 2000, the provision of alternative water supply to affected residents, and the monitoring program for the primary and secondary plumes. As discussed in more detail below, EPA permitted the PRPs to test an alternative technology to the extraction and treatment system selected, and a full scale in-situ biosparge treatment system has been operating for the treatment of the primary plume since 2005. In September 2009 a ROD Amendment was signed which formally replaced the extraction and treatment system selected in the 1995 ROD with the operational biosparge system.

The 1995 ROD's RAOs were updated to specifically address the primary plume in the 2009

ROD Amendment, as follows:

- o Prevent unacceptable exposure of human receptors to COCs through ingestion, direct contact or inhalation of COCs in the primary plume of groundwater; and
- o Restore the Old Bridge Aquifer to groundwater conditions that are consistent with the contemplated use of the Aquifer within a reasonable period of time.

Remediation goals selected can be seen in Table 2.

The 2009 ROD Amendment changed the major elements of the remedy for the primary plume. The extraction and treatment system selected in the 1995 ROD has been superseded by the following remedial actions:

- o Continued operation of the biosparge treatment system, consisting of the injection of oxygen/air directly into the groundwater allowing natural microorganisms to biodegrade the COCs by creating an aerobic treatment zone in the near-field portion of the primary plume;
- o Monitored natural attenuation (MNA) of the far-field portion of the primary plume;
- o A long-term groundwater monitoring program, with both hydraulic and water quality monitoring, to continue to evaluate the effectiveness of remedial actions in restoring groundwater quality;
- o Institutional Controls to restrict contaminated groundwater usage, as well as a recommended strategy for addressing the potential for soil vapor intrusion in new construction.

Based upon the monitoring data collected for the secondary plume, the ROD Amendment made no changes to this part of the 1995 ROD.

Remedy Implementation:

As noted above, connection to the municipal water supply was provided to affected/potentially affected residences. This work was initially performed between 1989 and 1992, before the ROD was signed. Since that time, in 2003/2004, the Group provided connections to additional homes further downgradient of the Site to address areas that were potentially threatened by groundwater contamination.

Design of the cap augmentation was completed in early 2000 to upgrade the existing cap to meet New Jersey standards. The main construction effort was completed in the fall of 2000; however, the surface water control aspects of the design, including surface water collection and discharge systems, were not fully implemented until late in 2004. In January 2005, the construction effort was certified as complete.

In 2000, a perimeter fence was installed around the Site.

From August 1999 to June 2000, the Group performed a small-scale biosparging pilot study at the Site to evaluate its potential effectiveness for remediating groundwater contamination at the Site. Design of the 1995 ROD's extraction and treatment remedy moved forward at the same time and was completed in March 2002. At the request of the Group, implementation of the extraction and treatment design was then delayed to allow for a full-scale biosparge pilot study, as directed in the 2004 AO. The full-scale pilot began operation in April 2005. Subsequent monitoring studies showed that COC concentrations in the near-field primary plume were decreasing, and as a result the extraction and treatment remedy was changed to the application of full-scale biosparge technology in the 2009 ROD Amendment.

The ROD also indicated that the far-field portion of the primary plume, as well as the secondary plume, would be monitored to determine the effectiveness of natural attenuation processes. Since 1998, regular groundwater monitoring events have been performed which provide water quality data on and around the Site, including throughout the primary and secondary plumes. Additional monitoring wells were installed to determine the limits of the secondary plume. Existing data from this monitoring well network suggests that, as a whole, concentrations of the most significant COCs have declined in both the far-field portion of the primary plume as well as the secondary plume. Based on this additional data, EPA has determined that MNA has been an effective remedy to date in addressing COCs downgradient of the Site.

A Remedial Action Work Plan (RAWP) for continued O&M of Site remedies was prepared by the Group and approved in September 2010. The RAWP addresses all remaining remedial activities, including O&M of the biosparge treatment facility, groundwater monitoring, and the institutional control measures discussed in the ROD and ROD Amendment. In addition to the deed notice required by the 1995 ROD for the landfill portion of the JIS Site, other required institutional controls include establishment of a Classification Exception Area (CEA) and associated Well Restriction Area (WRA) to regulate new potable well installations in the plume area until New Jersey Groundwater Quality Standards (NJGWQS) are reached for a Class II aquifer. The PRPs have performed several well searches to ensure that no new wells have been installed in the area over the plume. The initial CEA and WRA was approved in May 2013. The CEA requires a biennial certification, and EPA anticipates that the areal extent of the CEA will decrease over time as the contaminant plume diminishes. A deed notice for the JIS Property was recorded with Middlesex County on July 9, 2012.

The Group will also provide local authorities with data and information regarding the presence of chemicals in the shallow portion of the aquifer in the area around the Site. The Group will also notify any property owners within the impacted shallow groundwater plume, in accordance with the NJDEP Vapor Intrusion Guidance (October 2005), that future development in these areas needs to consider the potential for vapor intrusion. The local municipalities and property owners will receive updates on the status of their properties and the plume in accordance with the CEA biennial certification.

All of the remedial actions for the Site have been constructed and implemented in compliance with the 1995 ROD and the 2009 ROD Amendment. EPA has determined that no further remedial action is necessary other than long-term operation of the biosparge treatment system and monitoring of natural attenuation in groundwater. Human exposures and contaminated groundwater releases are under control.

System Operations/Operation and Maintenance:

The primary activities described in the RAWP include: continued operation of the in-situ biosparge treatment system; monitoring the effectiveness of the biosparge treatment system; monitoring the effectiveness of natural attenuation in the far-field primary and secondary plume areas downgradient of the biosparge system; inspection and maintenance of the landfill cap and other on-Site control measures, including deed restrictions; and development of institutional controls to protect property owners on and adjacent to the Site and the Site's groundwater plume until such time as they are no longer needed. A VI Sampling Plan was also developed and is included in the O&M of the remedy.

The biosparge groundwater monitoring program consists of the collection and analysis of groundwater samples from 45 monitoring wells that were installed along the alignment of the biosparge system. The wells are grouped into 15 well nests with each well nest including a shallow, intermediate, and deep screened interval. The wells in the core of the JIS plume are sampled quarterly, whereas the remainder of the wells in the biosparge monitoring network are sampled annually. The samples from the wells that are on the annual cycle are collected in April of each year to coincide with the annual sampling event for the plume monitoring program.

The annual groundwater monitoring program consists of the collection and analysis of groundwater samples from 20 wells in the JIS plume downgradient of the Site. The majority of these wells are within the JIS plume with the remainder being located just outside the plume which helps to delineate the extent of the plume. The tracking of the location of the plume and the concentrations of the chemicals within the plume are the primary purposes of the annual groundwater monitoring program. The wells are sampled for VOCs (including 1,4-dichlorobenzene and 1,2,4-trichlorobenzene), arsenic, and manganese in accordance with the Remedial Action Work Plan (CRA – Sept 2010).

Additionally, annual assessments for the potential for vapor intrusion in accordance with the 2011 "Vapor Intrusion Sampling Plan" at any nearby structures has been conducted at the Site during this reporting period. Sampling was conducted at a nearby residence until 2012, when the structure was demolished, and the JIS office building. Sampling has not shown elevated indoor air concentrations. No new homes have been constructed in the area of the plume during the reporting period. The potential for vapor intrusion at existing and any newly constructed structures in the future will be continue to be evaluated annually.

The groundwater monitoring program that tracks the progress of the groundwater improvement created by the biosparge remediation system has shown that temporal peaks in the concentrations of the influent groundwater occasionally occur. In 2010, a separate groundwater sampling event was performed to evaluate geochemical and biological conditions in the groundwater. The results confirmed that the levels of carbon source and microbial populations in the groundwater are sufficient for biodegradation. However, the results also confirmed that the levels of nutrients in some wells were at reduced levels and that the availability of nutrients could be a limiting factor in the complete degradation of chemicals of concern within the active treatment area; most likely during the episodic periods of peak influent concentrations. Accordingly, a pilot study of nutrient injection was performed in 2011 and documented in the Pilot Study Report (CRA - April 2011). Discussions of the benefits of nutrient injection are currently ongoing.

In addition to presenting results, the Pilot Study Report recommended the installation of three upgradient sentry wells and the conversion of two existing wells for the dual purpose of providing valuable groundwater information as well as a potential location for nutrient delivery, if required and approved. The EPA provided approval on November 25, 2013 to install the additional sentry wells and to convert wells PW-1 and PW-2 into monitoring wells.

Potential Site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the Site.

V. Progress Since the Last Review

The protectiveness statement in the 2010 five-year review report indicated that “Because the remedial actions are protective, the Site is protective of human health and the environment.”

Recommendations from the previous five-year review included making final the proposed classification exemption area, to develop and finalize a well restriction area, to continue monitoring at the existing house on the corner of JIS landfill for the potential for soil vapor intrusion, and to require that any construction of new buildings in the vicinity of the shallow portion of the plume should take into consideration appropriate protective measures with regard to the potential for soil vapor intrusion.

All of the recommendation have been implemented over the past five years and are discussed in more detail below.

Groundwater Institutional Controls

A CEA, and associated WRA, was finalized and approved in May 2013. The CEA will be re-evaluated biannually in accordance with New Jersey regulations.

Vapor Intrusion Monitoring

Annual vapor intrusion testing was conducted at the house on the corner of the JIS Landfill until 2012. The structure has been demolished and no longer exists. Note that the JIS office building continues to be sampled annually and results do not indicate elevated concentrations of VOCs.

Future Vapor Intrusion Investigation and Sampling Plan

In 2011, a Vapor Intrusion Sampling Plan was submitted to EPA and approved. The plan includes steps to take for investigation of the potential for vapor intrusion. The plan stated that results from annual groundwater sampling will be compared to New Jersey Groundwater Screening Levels (NJGWSLs) and EPA standards. If any sampling result exceeds the screening level, then an assessment of the potential for vapor intrusion of any structure within 100 feet of the sampling location will be conducted. The results of that study will determine if any additional sampling and/or a mitigation system is required.

Additionally, EPA sent the Mayor of Monroe Township a letter in 2011 notifying the Township of the contamination existing in the shallow aquifer. The letter stated that EPA has taken and it will continue to take, in concert with NJDEP and the PRPs, any measures needed to mitigate any unacceptable risks that VOC vapor intrusion may pose to individuals located near the Site, including risks to those who may occupy any structures built or to be built above or near the contaminant plume which exists in the shallow aquifer noted above and urged Monroe Township to do the same. EPA also suggested that the Township may want to consider the potential for vapor intrusion and the risk that that phenomenon may pose whenever approving construction plans, issuing any certificates of occupancy, etc. for any structures that will be built above or near the plume in the shallow aquifer in the future.

VI. Five-Year Review Process

Administrative Components:

The five-year review team included: Ashley Similo (RPM); Robert Alvey (Hydrogeologist); Abbey States (Human Health Risk Assessor); Mike Clemetson (member, Biological Technical Assistance Group, or “BTAG”), and Wanda Ayala (Community Involvement Coordinator). This is a PRP-lead Site.

Community Involvement:

EPA notified the community of the initiation of the five-year review process by publishing a notice on EPA’s webpage. The notice indicated that EPA would be conducting a five-year review of the remedy at the JIS Landfill to ensure the remedy remains protective of human health and is functioning as designed. The notice included the RPM’s address and telephone number for questions related to the five-year review process. In addition, the notice indicated that once the five-year review is completed, the results will be made available to the public on the Sites

webpage at www.epa.gov/region2/superfund/npl/jislandfill and at the U.S. EPA Records Center, 290 Broadway, New York, New York.

The RPM has not been notified of any concerns with the remedy based upon this public outreach.

Document Review:

The documents, data and information which were reviewed in completing this five-year review are summarized in Table 3.

Data Review:

Contaminant concentrations in groundwater have been regularly monitored since the ROD was issued in 1995. In general, concentrations have continued to decrease during the past five years, as they have since the closure of the landfill and installation of the modified RCRA cap in 2000. In accordance with a 2009 ROD Amendment and 2010 approved Remedial Action Work Plan, a biosparging system and biosparge monitoring program was implemented. In addition, the annual groundwater monitoring program consists of the collection and analysis of groundwater samples from wells in the JIS plume downgradient of the Site. The majority of these wells are within the JIS plume; the remainder located just outside the plume are being used to delineate the extent of the plume. The groundwater samples collected for the annual plume program are analyzed for VOCs, arsenic, and manganese. Arsenic levels in the groundwater samples have occasional detections exceeding MCLs/NJGWQSs; however, there is some uncertainty as to whether the source is Site-related or due to the natural occurrence of this mineral in the soils in the region. The biosparging (oxygen enhancement) treatment of groundwater from the JIS Landfill Site also reduces the arsenic levels. Manganese concentrations in groundwater also exceed MCLs/NJGWQSs, but are at levels that do not present a risk to human health. Sampling of wells for both arsenic and manganese will continue in accordance with the monitoring plan.

Figure 1 shows the location of the JIS landfill and monitoring wells. The contaminant plume from the JIS Landfill is limited to a relatively narrow band emanating in the area of MW- 5 and moving downgradient between on-Site wells MW-53 and MP-6. The biosparge injection system is located immediately downgradient of MW-53 and MP-6 and it provides treatment of the groundwater prior to reaching the downgradient property boundary. The levels of benzene detected at MW53 and MP-6 are shown on Figure 2. The levels of benzene continue to show decreasing trends in all three screen depths. The levels of benzene, however, show an increasing trend at MP-6 over the past 3 sampling events. The PRPs are investigating possible causes for the increase, which may include insufficient carbon source (nutrient supply) to support benzene degradation or the continued source contribution in the vicinity of the closed landfill. With few exceptions, the biosparging system has been successful in treating and mitigating further contaminant migration beyond the eastern property boundary. Additional biosparge and monitoring wells are planned to address locations of the higher constituent levels from the Site.

The effects of the addition of nutrients in this area for enhanced treatment is also under consideration.

As the JIS plume migrates downgradient from the landfill and crossing the biosparging transect along its easterly flow path, it also attenuates and migrates vertically toward the bottom of the aquifer which is on the order of 100 feet below the ground surface. The historical groundwater data have shown that by the time the plume has migrated 2,000 feet downgradient of the Site, what remains of the core of the plume has reached the deep portion of the aquifer, where it continues to attenuate.

The mitigation of off-Site migration and treatment of the JIS plume is evident by the current plume configuration. The operation of the biosparge system has bisected the plume; one plume segment remains beneath the landfill and the other plume segment is downgradient of the landfill (see Figure 2). This separation, which is approximately 1,000 feet, is the treated water zone that has been created by the biosparge system. The plumes continue to move with the groundwater flow regime which is estimated to migrate at a rate of about 1 foot per day. The oxygen enriched groundwater that was created by the biosparge system also continues to move at a rate of about 1 foot per day, thus extending the length of the treatment zone as it continues to migrate.

There are no exceedances of the NJGWQSs in monitoring wells screened in the shallow (water table) aquifer downgradient of the Site (wells located 100 feet from the property boundary). In the intermediate zone, the plume is limited, extending from well MW-23 to MW-20. The highest benzene concentration is 1.5 parts per billion (ppb) (at well MW-23) and the highest total VOC concentration is only 24 ppb (at well MW-20). In the deep zone, the plume extends from monitoring wells MW-34 to MW-60. The highest benzene concentration is 15 ppb at MW-60. The easternmost extent of the plume is now located in the vicinity of well MW-60. Historically, Well MW-25 had been defined as the easternmost extent of the secondary plume. The benzene concentrations at this well have decreased from 2,100 ppb in 2000, to less than 1,000 in 2004, to less than 100 in 2007, and have been below the NJGWQS of 1 ppb for both 2012 and 2013. The benzene concentration at well MW-60 has decreased from 47 ppb in 2007 to 15 ppb in 2013. These sampling results indicate that the downgradient plume is being sufficiently contained and treated by natural attenuation processes. Expectations are that the concentrations of VOCs will continue to decline as a result of continued operation of the biosparging system and will continue to be monitored.

Landfill Gas Monitoring

Monitoring of landfill gases has been conducted episodically over the past ten years since the cap was completed. Based upon the monitoring performed, it has been determined that landfill gas generation is minimal, that landfill gas is not migrating beyond the landfill perimeter, and that the existing venting system is capable of safely relieving any gases generated. Consequently, monitoring of the gas vents and probes is no longer required, as documented in the RAWP.

Site Inspection:

The inspection of the Site was conducted on August 28, 2014. In attendance were Ashley Similo (EPA RPM) and Robert Alvey (EPA hydrogeologist), and representatives of the Group, Chris Young (demaximis) and Jim Kay (CRA), and owners of the property. The purpose of the inspection was to assess the protectiveness of the remedy.

No issues were observed during the Site inspection.

Interviews:

There were no interviews conducted during the five-year review process.

Institutional Controls Verification:

Institutional controls for groundwater usage, soil vapor intrusion, and restrictions on the use of the landfill property have been implemented, as described in the 1995 ROD and 2009 ROD Amendment, since wastes are currently left in place at levels not allowing for unlimited use and unrestricted exposure. Figure 3 shows the aerial extent of the institutional controls; which sufficiently encompass the plume.

A deed notice for the JIS Property was recorded with Middlesex County on July 9, 2012. In addition to the deed notice required by the 1995 ROD for the landfill portion of the JIS Site, other required institutional controls include establishment of a CEA and associated WRA to regulate new potable well installations in the plume area until NJGWQS are reached for a Class II aquifer. The PRPs have performed several well searches to ensure that no new wells have been installed in the area over the plume. The initial CEA and WRA was approved in May 2013. The CEA requires a biennial certification (the first of which will be conducted in 2015), and EPA anticipates that the areal extent of the CEA will decrease over time as the contaminant plume diminishes.

VII. Remedy Assessment

Question A: Are the remedies functioning as intended by the decision documents?

The remedy is functioning as intended by the ROD and ROD amendment. The source control remedy selected in the 1995 ROD consisted of upgrading the existing landfill cap, an extraction and treatment system to remediate the portion of the groundwater plume closer to the landfill, and monitored natural attenuation for the secondary plume. The 2009 ROD amendment formally replaced the extraction and treatment system selected with the in-situ biosparge system operating at the Site.

The biosparge treatment system in combination with monitoring and natural attenuation is used to restore the groundwater to federal and State standards. The remedy continues to prevent direct

contact with the contaminated groundwater and soils and inhibit the spread of contamination throughout the groundwater. All groundwater sampling points downgradient of the biosparge injection points with COCs above MCLs display a general decreasing trend during the five-year review period. All samples containing the maximum COCs measured during the five year review period were collected upgradient of the treatment system. The contaminants of concern in groundwater and respective cleanup goals are shown in Table 2.

Based on the review of the recent groundwater monitoring data, the only exceedences in the shallow groundwater are within 100 feet of the Site. The shallow groundwater discharges into the Manalapan Brook which is approximately two miles east of the Site. Therefore, the remedy is functioning as intended for ecological purposes.

Institutional controls restricting future use of the Site were implemented in 2013 in the form of a CEA/WRA filed with the Middlesex County Registry which will be biannually certified by NJDEP. The September 2010 Remedial Action Work Plan outlines institutional controls in place to ensure sufficient notification of future property owners within the shallow groundwater plume of the potential for vapor intrusion with further development.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?

There are no changes in the physical conditions of the Site or Site uses that would affect the protectiveness of the selected remedy. The land use considerations and potential exposure pathways considered in the baseline human health risk assessment are still valid.

In response to recommendations in the 2010 five-year review, a Vapor Intrusion Sampling Plan prepared by CRA as an addendum to the Remedial Action Work Plan evaluated the vapor intrusion pathway for the JIS property and the immediately adjacent properties. In addition to screening shallow groundwater sampling results for vapor intrusion potential, indoor air and sub-slab soil gas monitoring was recommended for the JIS office building and the residence adjacent to the JIS property to the south. Shallow groundwater samples taken from the JIS property during this five-year review period continue to exceed screening levels for benzene, 1,4-dichlorobenzene, TCE, and chlorobenzene. VOC exceedances were also detected in shallow groundwater off the JIS property immediately downgradient of the source area, with a maximum total VOC concentration of 51 ppb at MW-7S.

Soil gas sampling results from the residence also exceeded screening levels for benzene and TCE. The southern residence has been demolished since sampling was conducted in 2012, but earlier sub-slab results indicate that appropriate protective measures should be taken into consideration if redevelopment were to occur above the shallow groundwater plume. The most recent indoor air samples from the JIS office building do not exceed screening levels. However, due to elevated VOC concentrations in the shallow groundwater and soil gas in the immediate vicinity of the Site, it is recommended that monitoring continue as a conservative measure.

As noted in the previous five-year review, contamination gets deeper as it travels further downgradient; therefore, vapor intrusion is not a concern over the secondary plume as vapors are not expected to migrate through clean water and into nearby homes. However, there is residential development over much of the lateral area of the plume, and future development in the area is a possibility. Therefore, groundwater, particularly the shallow interval near the landfill source area, must continue to be carefully monitored to ensure that contamination in the shallow groundwater is not posing a vapor intrusion concern. Future development above the shallow groundwater plume should evaluate the need for mitigation systems or vapor barriers; this should be verified as part of the next five-year review.

Several VOCs, as well as arsenic and manganese, remain in excess of state and federal MCLs both in the source area and downgradient of the treatment system. The evaluation of the groundwater focused on two primary exposure pathways—direct ingestion (as a potable water source) and the possibility of vapor intrusion if buildings were to be constructed over the plume. The evaluation of the direct contact pathway showed that since there are no wells in the contaminated area, there is no exposure. Therefore, the remedy is protective even though groundwater exceeds drinking water standards. Groundwater monitoring will continue to ensure the performance of the biosparge treatment system and the natural attenuation process.

The exposure assumptions and the toxicity values that were used to estimate the potential risks and hazards to human health followed the general risk assessment practice at the time the initial risk assessment was performed in 1995; this was also the case for the risk assessment supporting the ROD amendment in 2009. Although specific parameters and toxicity values may have changed since that time, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid.

Toxicity data for methylene chloride, TCE, and tetrachloroethylene have been updated since the time of remedy selection. The new reference doses (RfDs) and associated screening values do not impact the remedy selection or cleanup levels, and the process that was used in the human health risk assessment for the Site is still valid.

Although the ecological risk assessment screening and toxicity values used to support the 1995 ROD may not necessarily reflect the current values, the landfill cap eliminates any potential risk from surface soil contaminants to terrestrial receptors. As noted in the ROD and ROD Amendment, sediment and surface water samples collected from the Manalapan Brook did not contain any measurable contamination. Additionally, a Screening Level Ecological Risk Assessment (SLERA) was conducted in 2009 for downgradient surface water discharge areas associated with the secondary plume. The SLERA concluded that there are no significant ecological effects in these discharge areas. Consequently, the exposure assumptions remain appropriate and thus the remedy remains protective of ecological resources.

Question C: Has any other information come to light that could call into question the protectiveness of the remedies?

Based on the evaluation of the potential human exposures at the Site there is no new information that could call into question the protectiveness of this remedy.

Technical Assessment Summary

Based on the data reviewed and the Site inspection, the remedy is functioning as intended by the ROD and the ROD Amendment. The cap is effectively limiting the infiltration of water into and through the landfill materials, and it appears to have had positive impacts on groundwater conditions. The cap also prevents direct exposure, and fencing restricts access to the Site. All private wells that have been impacted (or could potentially be impacted) have been replaced with connections to the municipal water supply. The biosparging treatment system has proven to be effective in reducing concentrations of COCs in the primary plume. Also, MNA is occurring in the far-field primary and secondary plume. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy.

VIII. Recommendations and Follow-up Actions

There were no issues that require recommendations and follow-up actions identified during the five-year review.

IX. Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> 1	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> N/A
<i>Protectiveness Statement:</i> The remedy at OU1 is protective of human health and the environment.		

Sitewide Protectiveness Statement (if applicable)	
<i>For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.</i>	
<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> N/A
<i>Protectiveness Statement:</i> The remedy is protective of human health and the environment.	

X. Next Review

The next five-year review report for the JIS Landfill Superfund Site is required five years from the completion of this review.

Table 1: Chronology of Site Events

Events	Date
Property used as a borrow pit for road construction	1950 to 1955
Property bought by Jones Road Material Company and landfilling begins	1955
NJDEP approves Site for landfilling	1970
Court order prohibits disposal of hazardous waste at the Site	1976
Site listed on NPL	September 1983
NJDEP revokes the landfill registration for the Site	June 1984
Court issues order for closure of the landfill	December 1985
Initial landfill cap installed	1980 to 1985
Administrative Consent Order signed to fund Site RI/FS	June 1987
RI/FS and Risk Assessment completed	August 1993
Proposed Plan issued	November 1994
Record of Decision issued	August 1995
Administrative Consent Order to implement provisions of ROD with NJDEP	1997
First Biosparge Pilot	1999 to 2000
Administrative Consent Order to perform more RI work on Secondary Plume	2004
Final landfill cap certified as complete	January 2005
First five-year review submitted	June 2005
RI Addendum issued for Secondary Plume Area	July 2009
Record of Decision Amendment issued for Primary Plume	September 2009
Preliminary Close Out Report signed	September 2009
Second five-year review	April 2010
Remedial Action Work Plan for Biosparge System	September 2010
Unilateral Administrative Order with EPA	September 2010
Signed Deed Notice	January 2012
Final Classification Exemption Area	May 2013

**Table 2 – Remediation Goals
(from 2009 ROD Amendment)**

Parameter	Groundwater Criteria¹ (ppb)
<i>Volatile Organic Compounds</i>	
1,3-dichlorobenzene	600
1,1-dichloroethane	50
1,2-dichlorobenzene	600
1,1,1-trichloroethane	30
4-methyl-2-pentanone	100
1,1-dichloroethene	1
Ethylbenzene	700
Acetone	6,000
1,4-dichlorobenzene	75
Vinyl chloride	1
Trans-1,2-dichloroethene	100
Chloroform	70
1,2-dichloroethane	2
Xylene (total)	1,000
1,1,2,2-tetrachloroethane	1
Cis-1,2-dichloroethene	70
1,2-dichloropropane	1
Tetrachloroethene	1
Methylene chloride	3
Toluene	600
Chlorobenzene	50
Trichloroethene	1
Benzene	1
<i>Semi-Volatile Organic Compounds</i>	
Nitrobenzene	6
1,2,4-trichlorobenzene	9
<i>Metals</i>	
Barium	2,000
Barium, dissolved	200
Chromium, dissolved	70
Copper	1,300
Copper, dissolved	1,300
Nickel	100

Nickel, dissolved	100
Zinc	2,000
Zinc, dissolved	2,000
Antimony, dissolved	6
Chromium (total)	70
Lead, dissolved	5
Antimony	6
Cadmium, dissolved	4
Cadmium	4
Lead	5
Arsenic, dissolved	3
Arsenic	3
Manganese, dissolved	50
Manganese	50

¹ Groundwater cleanup criteria is the lower value of the NJGWQS or USEPA MCL.

Table 3: List of Documents, Data and Information Reviewed

Administrative Consent Order with NJDEP	June 1987
Administrative Order of Consent addenda	December 1989, October 1991, June 1997
Remedial Investigation / Risk Assessment for the JIS Landfill	July 1992
Record of Decision for the JIS Landfill	August 1995
Landfill Cap Design and the Operation and Maintenance Plan	September 1999
Detailed Report	November 2000
Administrative Consent Order	August 2004
Chemical Concentration Trends Report	May 2005
Remedial Investigation Addendum, Secondary Plume Area	July 2009
Record of Decision Amendment	September 2009
Preliminary Close Out Report	September 2009
Remedial Action Work Plan	September 2010
Unilateral Administrative Order	September 2010
Semi-annual and Annual reports from Conestoga-Rovers & Associates	2010-2014
Annual Vapor Intrusion reports	2010-2014
Nutrient Injection Pilot Study	March 2013

Figure 1 – Site Map

Figure 1- JIS Landfill Site, Monitoring Wells, and Groundwater Plume

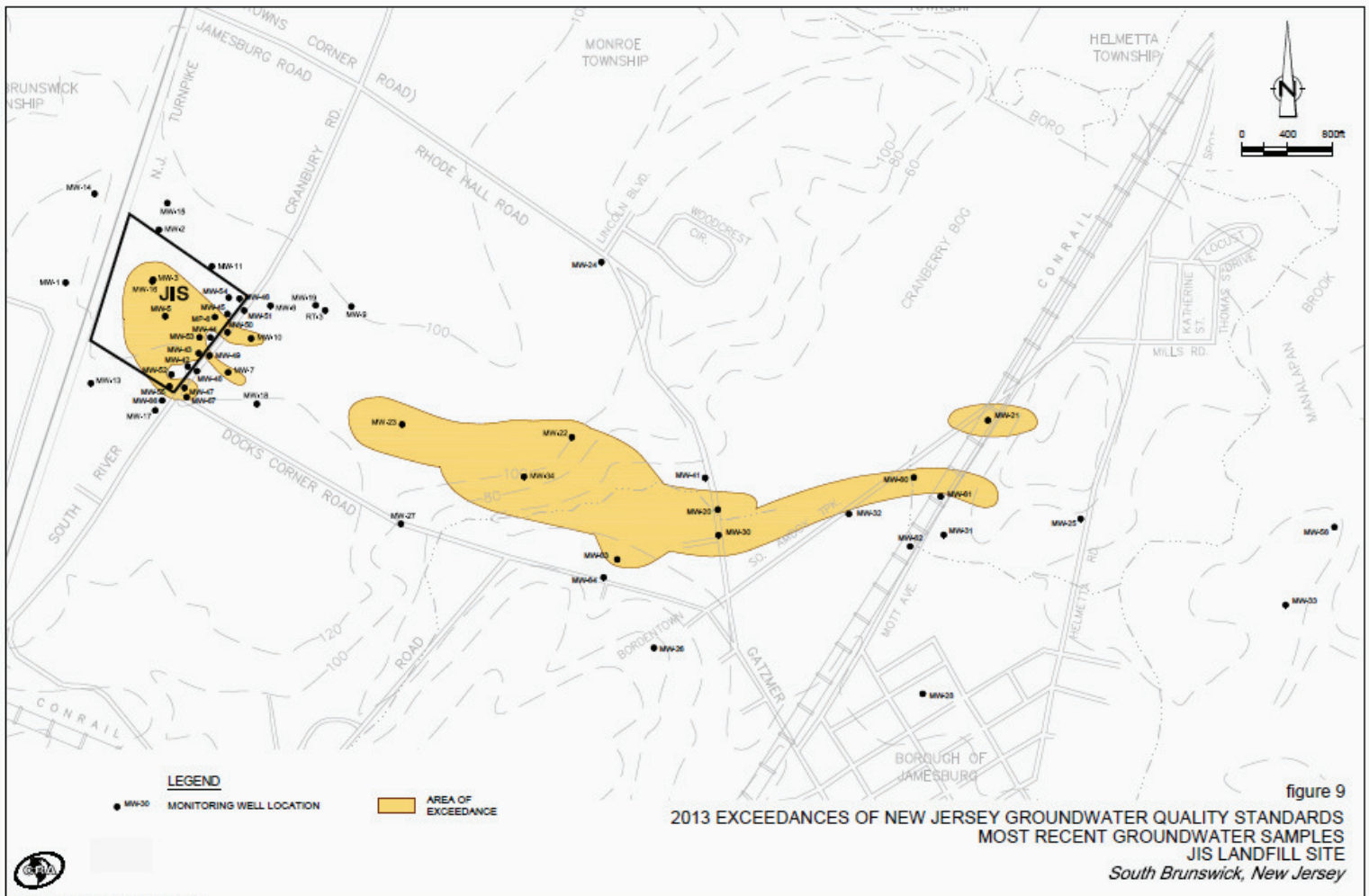


Figure 2 – Benzene Concentrations at MW-53 and MP-6

Figure 2 Sampling Results for Benzene, Monitoring Well MW-53 and MP-6 JIS Landfill

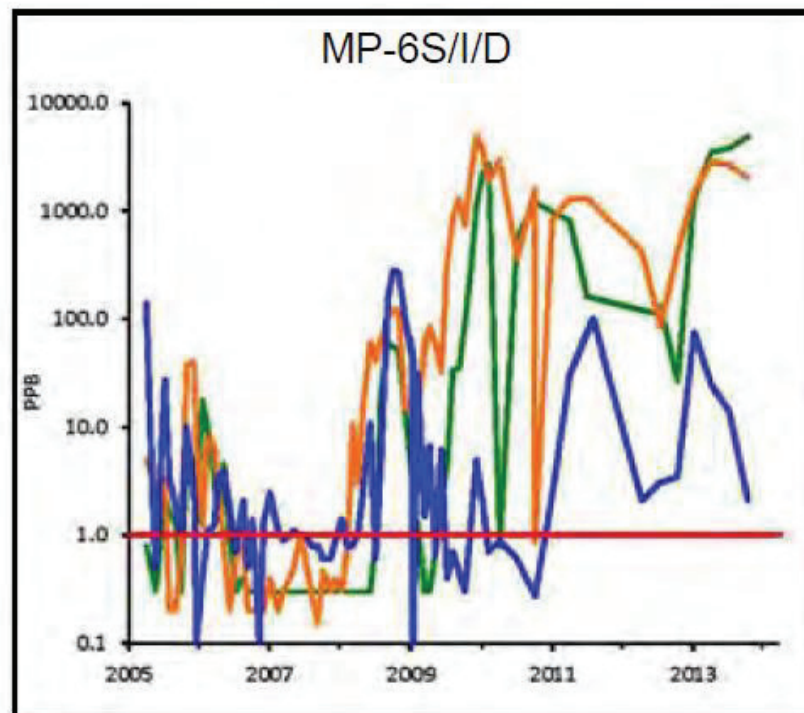
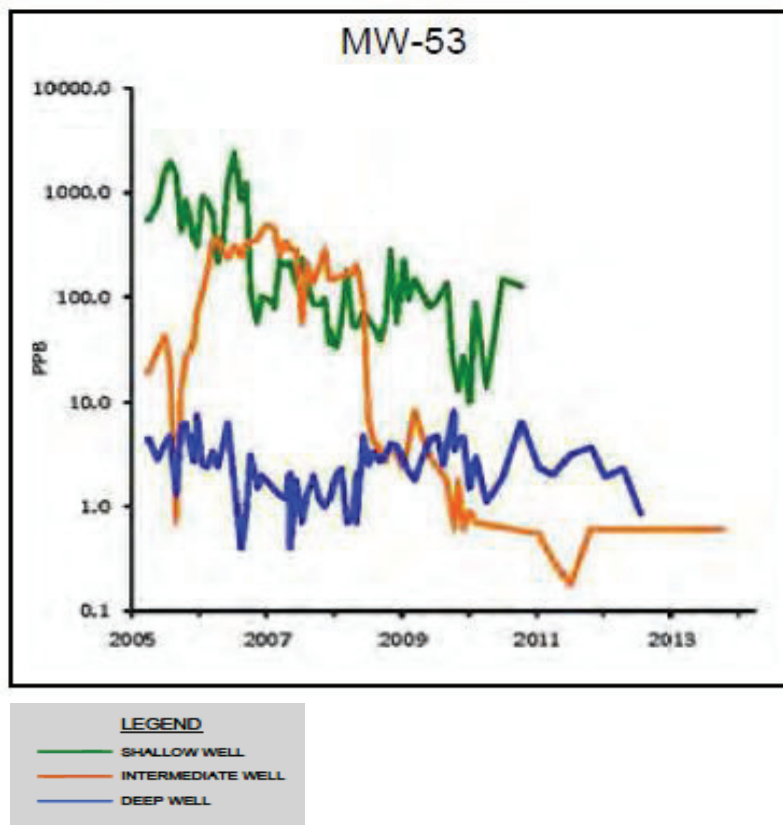


Figure 3 – Areal Extent of Plume

Figure 3 Classification Exception Area and Well Restriction Areal Extent, JIS Landfill

